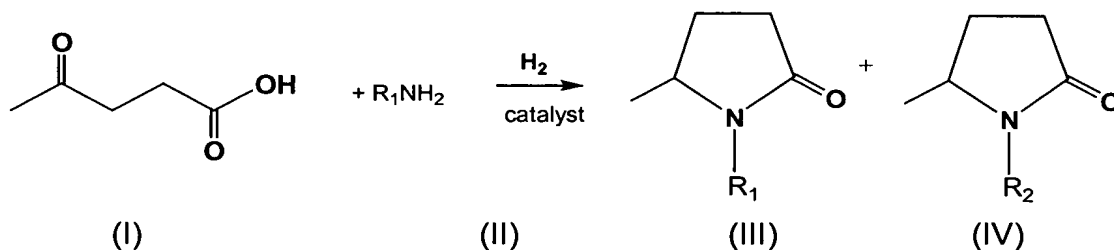


CLAIMS

What is claimed is:

1. A process for preparing a reaction product comprising 5-methyl-N-aryl-2-pyrrolidone (III), 5-methyl-N-cycloalkyl-2-pyrrolidone (IV), or a mixture thereof, which comprises the step of contacting the compound levulinic acid (I) with an aryl amine (II) in the presence of hydrogen gas and a catalyst, the catalyst being optionally supported on a catalyst support, and, optionally, said contacting is performed in the presence of a solvent;

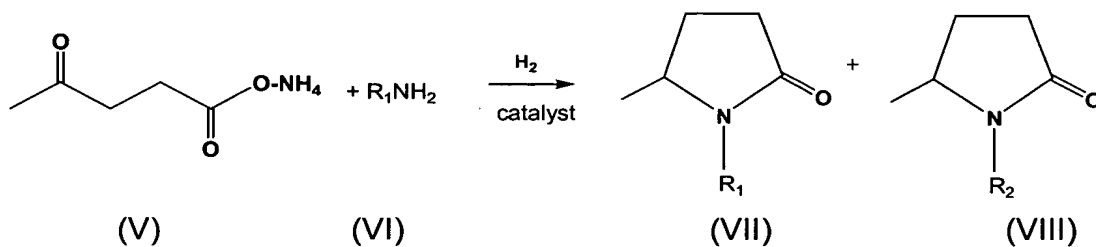
10



wherein R_1 is an aromatic group having from 6 to 30 carbons and R_2 is a fully or partially reduced derivative of R_1 .

2. A process for preparing a reaction product comprising 5-methyl-N-aryl-2-pyrrolidone (VII), 5-methyl-N-cycloalkyl-2-pyrrolidone (VIII), or a mixture thereof, which comprises the step of contacting an ammonium salt of levulinic acid (V) with an aryl amine (VI) in the presence of hydrogen gas and a catalyst, the catalyst being optionally supported on a catalyst support, and, optionally, said contacting is performed in the presence of a solvent;

20

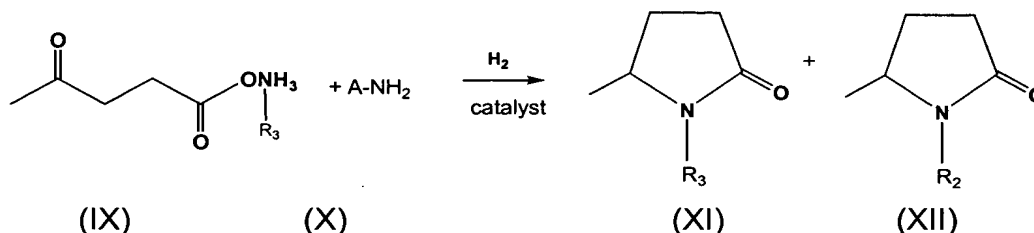


wherein R_1 is an aromatic group having from 6 to 30 carbons and R_2 is a fully or partially reduced derivative of R_1 .

3. A process for preparing a reaction product comprising 5-methyl-N-aryl-2-pyrrolidone (XI), 5-methyl-N-cycloalkyl-2-pyrrolidone (XII), or a mixture thereof, which comprises the step of contacting an R_3 -ammonium

salt of levulinic acid (IX) with ammonia or ammonium hydroxide (X) in the presence of hydrogen gas and a catalyst, the catalyst being optionally supported on a catalyst support, and, optionally, said contacting is performed in the presence of a solvent;

5



wherein R_3 is an aromatic group having from 6 to 30 carbons, R_2 is a fully or partially reduced derivative of R_3 , and A is hydrogen or hydronium ion (H_3O^+).

10

4. The process as recited in Claims 1, 2 or 3, wherein the catalyst is selected from metals selected from the group consisting of nickel, copper, cobalt, iron, rhodium, ruthenium, rhenium, osmium, iridium, platinum, palladium, at least one Raney metal; compounds thereof; and combinations thereof.

15

5. The process as recited in Claim 4, wherein the catalyst is palladium, platinum, rhodium, compounds thereof, and combinations thereof.

6. The process as recited in Claim 3, wherein the catalyst is supported to form a supported metal catalyst and the content of the metal in the supported metal catalyst is from 0.1% to 20% by weight.

20

7. The process as recited in Claims 1, 2 or 3, wherein the catalyst support is selected from the group consisting of carbon, alumina, silica, silica-alumina, silica-titania, titania, titania-alumina, barium sulfate, calcium carbonate, strontium carbonate, compounds thereof, and combinations thereof.

25

8. The process as recited in Claim 7, wherein the carbon has an ash content, the ash content being less than about 5% by weight of the catalyst support, and optionally wherein the carbon has a surface area of more than about $200 \text{ m}^2/\text{g}$.

30

9. The process as recited in Claims 1, 2 or 3, wherein the process is optionally performed in the presense of a promoter.

10. The process as recited in Claims 1, 2 or 3, wherein R_1 and R_3 are aromatic groups having 6 to 12 carbons, and wherein R_2 is a cycloalkyl group having 6 to 12 carbons.

11. The process as recited in Claims 1, 2 or 3, wherein the molar ratio of Formula (II), (VI) or (X) to Formula (I), (V) or (IX) is from about 0.01/1 to about 100/1 at the start of the reaction.

12. The process as recited in Claim 11, wherein the reaction is performed at a temperature of from about 50°C to about 300°C.

13. The process as recited in Claim 11, wherein the reaction is performed at a hydrogen pressure of from about 0.3 MPa to about 20 MPa.

14. The process as recited in Claim 6, wherein the supported metal catalyst is selected from the group consisting of palladium on carbon, palladium on calcium carbonate, palladium on barium sulfate, palladium on alumina, palladium on titania, platinum on carbon, platinum on alumina, platinum on silica, iridium on silica, iridium on carbon, iridium on alumina, rhodium on carbon, rhodium on silica, rhodium on alumina, nickel on carbon, nickel on alumina, nickel on silica, rhenium on carbon, rhenium on silica, rhenium on alumina, ruthenium on carbon, ruthenium on alumina and ruthenium on silica and combinations thereof.

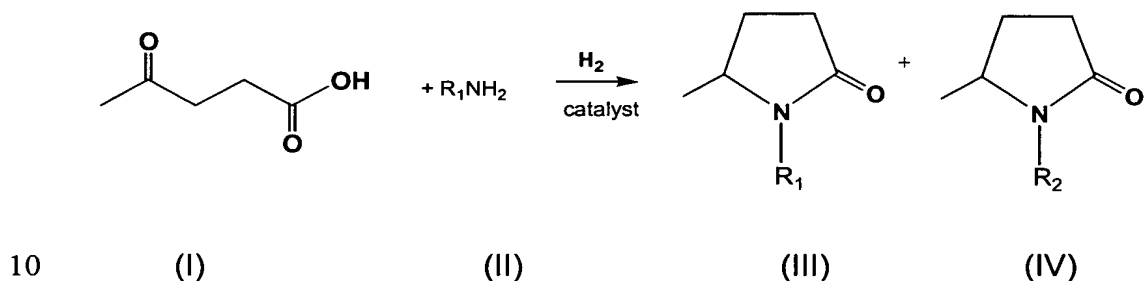
15. The process as recited in Claim 14, wherein the supported metal catalyst is selected from the group consisting of palladium on carbon, palladium on alumina, palladium on titania, rhodium on carbon, rhodium on alumina, platinum on carbon, platinum on alumina, and combinations thereof.

16. The process as recited in Claims 1, 2 or 3, wherein the solvent medium for the reaction is selected from the group consisting of water, alcohols, ethers, ammonia, ammonium hydroxide, aryl amines of Formula (II) or Formula (VI), pyrrolidones and the reaction product of Claim 1, 2 or 3, respectively.

17. The process as recited in Claims 1, 2 or 3, wherein R_1 and R_3 are aromatic groups having from 6 to 12 carbons and R_2 is a cycloalkyl group having from 6 to 12 carbons, wherein the catalyst is supported and the supported catalyst is palladium on carbon or palladium on titania, and wherein the temperature of the reaction is from about 75°C to 200°C and the pressure of the reaction is from about 1.3 MPa to about 7.6 MPa.

18. A process for preparing a pharmaceutical composition, the process comprising the steps of:

- 5 i) preparing 5-methyl-N-cycloalkyl-2-pyrrolidone (IV) using a process comprising the step of contacting levulinic acid (I) with an aryl amine (II) in the presence of hydrogen gas and a metal catalyst, the metal catalyst being optionally supported, and, optionally, in the presence of a solvent;

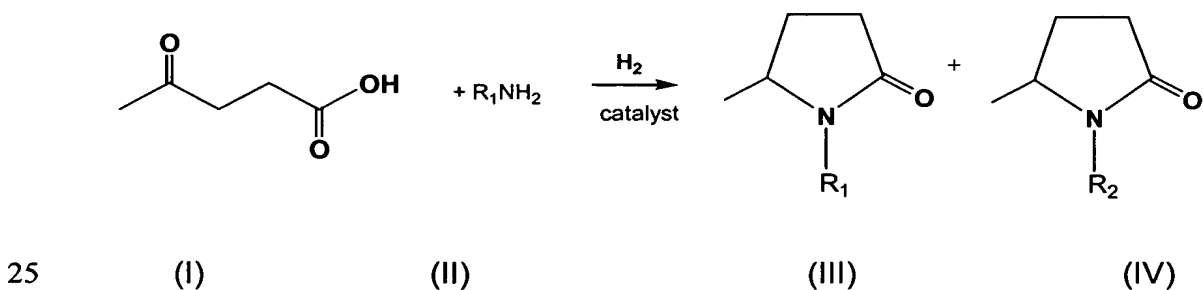


wherein R_1 is an aromatic group having from 6 to 30 carbons and R_2 is a fully or partially reduced derivative of R_1 ; and

- 15 ii) contacting 5-methyl-N-cycloalkyl-2-pyrrolidone (IV) with at least one pharmaceutically therapeutic agent.

19. A process for preparing an agrochemical composition, the process comprising the steps of:

- 20 i) preparing 5-methyl-N-cycloalkyl-2-pyrrolidone (IV) using a process comprising the step of contacting levulinic acid (I) with an aryl amine (II) in the presence of hydrogen gas and a metal catalyst, the metal catalyst being optionally supported, and, optionally, in the presence of a solvent;

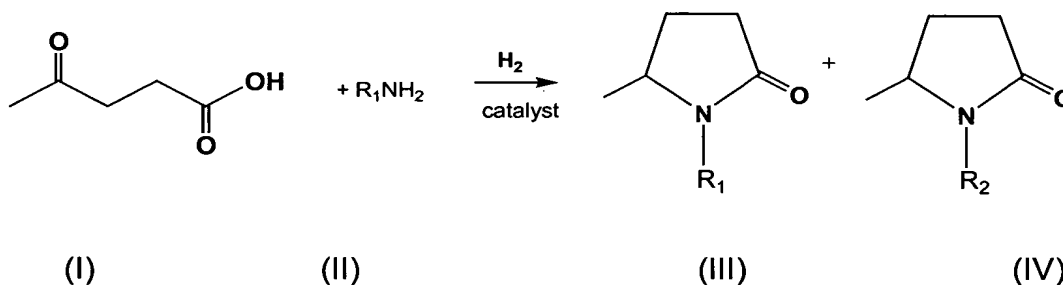


wherein R_1 is an aromatic group having from 6 to 30 carbons and R_2 is a fully or partially reduced derivative of R_1 ; and

- ii) contacting 5-methyl-N-cycloalkyl-2-pyrrolidone (IV) with at least one agrochemically effective agent.

5 20. A process for preparing a cleaning composition, the process comprising the steps of:

- i) preparing 5-methyl-N-cycloalkyl-2-pyrrolidone (IV) using a process comprising the step of contacting levulinic acid (I) with an aryl amine (II) in the presence of hydrogen gas and a metal catalyst, the metal catalyst being optionally supported, and, optionally, in the presence of a solvent;

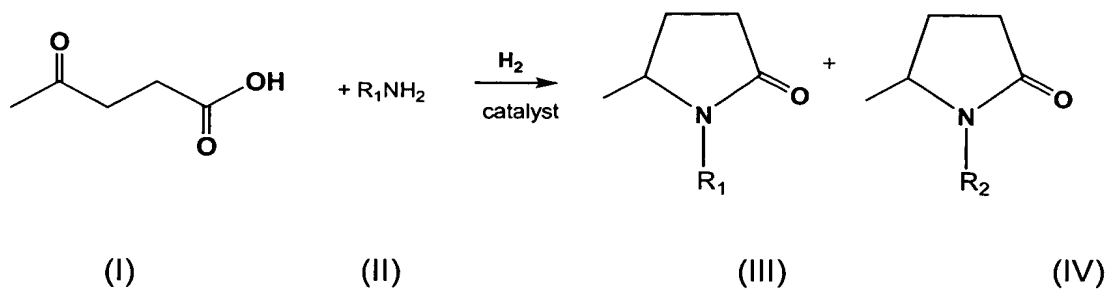


15 wherein R_1 is an aromatic group having from 6 to 30 carbons and R_2 is a fully or partially reduced derivative of R_1 ; and

- ii) contacting 5-methyl-N-cycloalkyl-2-pyrrolidone (IV) with a compound selected from the group consisting of anionic surfactants, nonionic surfactants, cationic surfactants, amphoteric surfactants, glycols, glycol ethers, aliphatic alcohols, alkanolamines, pyrrolidones, water, and mixtures thereof.

20 21. A process for preparing an ink jet ink composition, the process comprising the steps of:

- i) preparing 5-methyl-N-cycloalkyl-2-pyrrolidone (IV) using a process comprising the step of contacting levulinic acid (I) with an aryl amine (II) in the presence of hydrogen gas and a metal catalyst, the metal catalyst being optionally supported, and, optionally, in the presence of a solvent;



5

wherein R_1 is an aromatic group having from 6 to 30 carbons and R_2 is a fully or partially reduced derivative of R_1 ; and

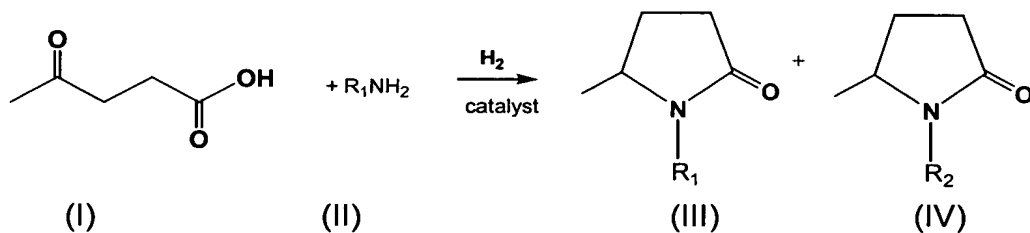
ii) contacting 5-methyl-N-cycloalkyl-2-pyrrolidone (IV) with at least one colorant.

10

22. A process for preparing a refrigerant or air conditioning lubricant, the process comprising the steps of:

i) preparing 5-methyl-N-cycloalkyl-2-pyrrolidone (IV) using a process comprising the step of contacting levulinic acid (I) with an aryl amine (II) in the presence of hydrogen gas and a metal catalyst, the metal catalyst being optionally supported, and, optionally, in the presence of a solvent;

15



20

wherein R_1 is an aromatic group having from 6 to 30 carbons and R_2 is a fully or partially reduced derivative of R_1 ; and

ii) contacting 5-methyl-N-cycloalkyl-2-pyrrolidone (IV) with at least one refrigerant.

25